

All four of these species appear to occupy their cliff-side stations rather because the latter are somewhat free from other competing shrubs than because here is found an ideal environment. Indeed, the *Artemisias* and the *Inula* in good soil have a robuster habit and more abundant foliage than along the faces of the tufa cliffs where their presence is most characteristic.

Summing up the results of the observations made upon the nine species dealt with in this paper, the members of this flora may be classed according to their qualifications to endure high temperature with deprivation of water as follows:

Succulents, extremely resistant . . . . .	{ <i>Opuntia Ficus-Indica</i> <i>Mesembryanthemum acinaciforme</i>
Uninjured by drought, retaining all foliage	<i>Matthiola rupestris</i>
Summer deciduous, highly resistant . . . . .	{ <i>Spartium junceum</i> <i>Medicago arborea</i>
Leaves and branches often dying <i>in situ</i> , moderately resistant . . . . .	{ <i>Artemisia arborescens</i> <i>Artemisia variabilis</i> <i>Helichrysum rupestre</i> <i>Inula viscosa</i>

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## A NEW GENUS OF OPHIOGLOSSACEAE.

(WITH ONE FIGURE)

DURING the spring of 1903 the writer discovered the gametophytes of *Botrychium obliquum* Muhl., and later announced the fact in a catalogue of the pteridophytes of Minnesota.<sup>1</sup> Since that time both sporophyte and gametophyte of this and other species of *Botrychium* have been subjected to careful study. The gametophytes of *Botrychium virginianum* have been found in large numbers, and a few gametophytes of *B. simplex* and *B. matricariaefolium* were found in 1904. While the results of the investigation are not ready for final publication, it seems at the present time desirable to call attention to the embryo of *Botrychium obliquum*, as it affords evidence bearing on a question now being agitated by others. In two recent papers CAMPBELL<sup>2</sup> has disputed BOWER's contention that the Ophioglossaceae are allied to the Lycopodiales. CAMPBELL would derive them directly from the Bryophyta.

The gametophytes of *Botrychium obliquum* are subterranean and destitute of chlorophyll. They grow by a distinct apical meristem, are

<sup>1</sup> Minn. Bot. Studies 3:249. 1903.

<sup>2</sup> (1) American Naturalist 38:761-775. 1904; (2) *ibid.* 39:273-285. 1905.

flattened dorsiventrally, and possess many long rhizoids. They are monoecious. The reproductive organs are developed on the flattened dorsal side and in their organization differ essentially from those of *Botrychium virginianum* as described by JEFFREY.<sup>3</sup>

The oosperm upon segmentation does not develop directly into a

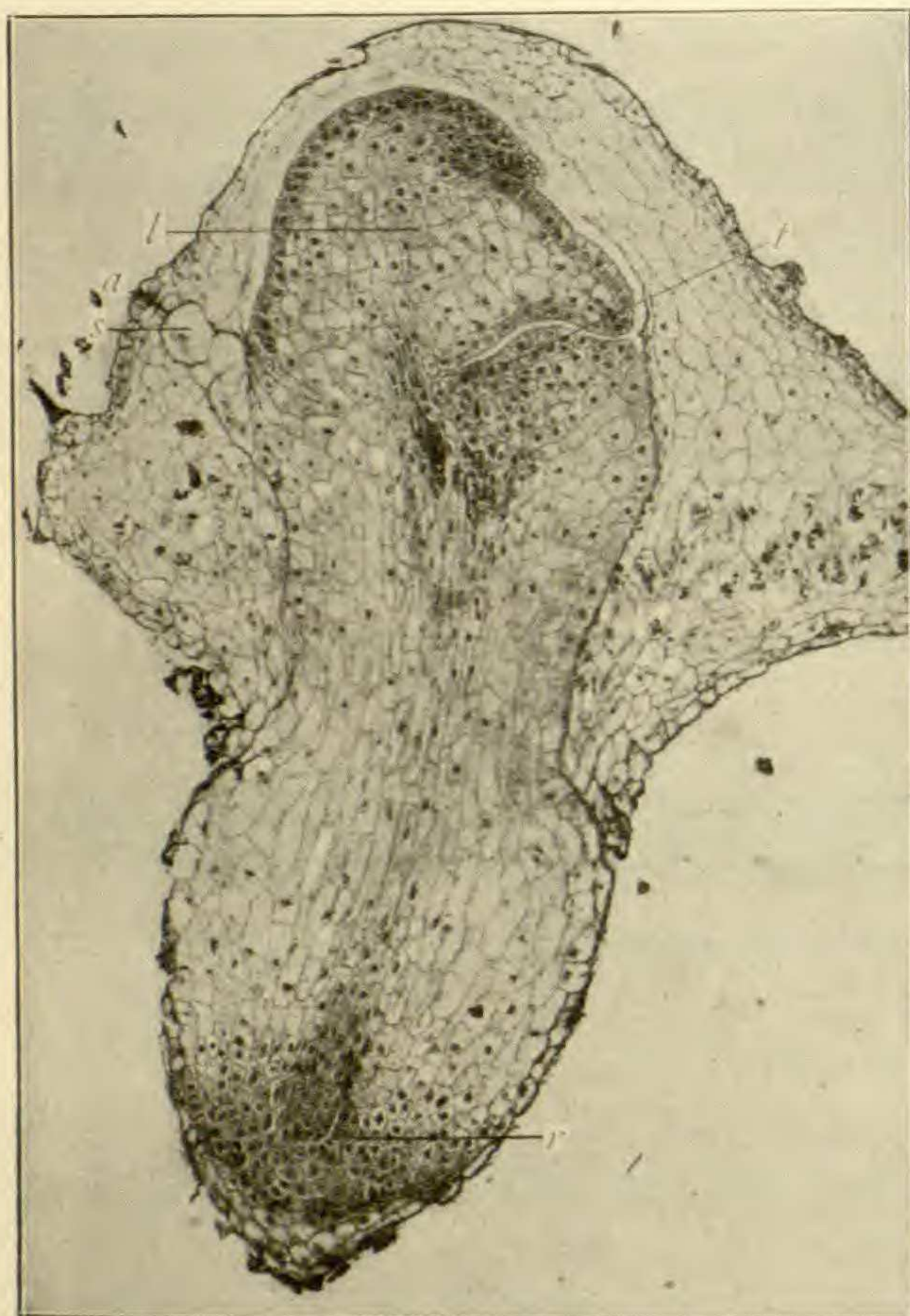


FIG. 1.—Photomicrograph of a section through a gametophyte and young sporophyte of *Sceptridium obliquum*. The section is vertical, and transverse of the gametophyte. The root is already protruded from the under side of the gametophyte, while the position of the first leaf was marked by a pronounced elevation on the upper side. *a*, archeogonium; *s*, suspensor; *t*, stem tip; *l*, first leaf; *r*, root.  $\times 60$ .

embryo and its orientation in the gametophyte are well illustrated by the accompanying figure.

A study of the mature sporophytes of the ternate species of *Botrychium*

spherical protocorm, as is the case in all other ferns which have been studied, but *first gives rise to a long suspensor*, which burrows into the tissue of the gametophyte in the manner characteristic of certain lycopod embryos. At the tip of this suspensor a spherical protocorm is organized, out of which the stem and root apices are shortly differentiated. The axis of the metacorm transfixes the protocorm and all the tissue of the latter, except the suspensor, becomes a permanent part of the metacorm. The embryo does not, therefore, possess a lateral cotyledon (nursing-foot) as does *Botrychium virginianum*. The root grows downward and *emerges from the under side* of the gametophyte, and at a later period the first leaf breaks through the upper surface. The relation of the members in the young

<sup>3</sup> Univ. of Toronto Studies 1:1-32. 1898.

discloses unique characters which alone mark them as a natural group entitled to generic rank. Considering, in addition, the anomalous character of their embryos as illustrated by *Botrychium obliquum*, it appears at once desirable to segregate them as a distinct genus.

The writer would therefore suggest the name **Sceptridium** (from σκῆπτρον), in allusion to the scepter-like sporangiophore.

**SCEPTRIDIUM**, a new genus of Ophioglossaceae.

Stem subterranean, short, erect, with many clustered roots. Sporophyll dividing near the stem into a long petioled sporangiophore and a shorter petioled sterile segment. Sporangiophore erect, bi-, tri-, or even quadri-pinnate, bearing naked, spherical sporangia in two rows. Sterile segment inserted obliquely near or at the surface of the ground, ternately divided or compound. Gametophyte tuberous, subterranean, saprophytic, monoecious. Embryo with a suspensor and without a pronounced lateral cotyledon; its axis straight, the root emerging from the lower side of the gametophyte.

To this genus should be referred the following described but ill-defined species and varieties:

**Sceptridium australe** (R. Br.).—*Botrychium australe* R. Br., Prodr. Fl. Nov. Holl. 164. 1810.

**Sceptridium biforme** (Colenso).—*Botrychium biforme* Colenso, Trans. New Zeal. Inst. 18:223. 1886.

**Sceptridium biternatum** (Lam.).—*Osmunda biternata* Lam., Encyc. Meth. Bot. 4:650. 1797. *Botrychium biternatum* (Lam.) Underw., Bot. GAZETTE 22:407. 1896.

**Sceptridium californicum** (Underw.).—*Botrychium californicum* Underw., Torreyia 5:107. 1905.

**Sceptridium Coulteri** (Underw.).—*Botrychium Coulteri* Underw., Bull. Torr. Bot. Club 25:537. 1898.

**Sceptridium daucifolium** (Hook. & Grev.).—*Botrychium daucifolium* Hook. & Grev., Ic. Fil. 2: pl. 161. 1831.

**Sceptridium decompositum** (Mart. & Gal.).—*Botrychium decompositum* Mart. & Gal., Mém. Acad. Sci. Bruxelles 15:—(15). pl. 1. 1842.

**Sceptridium dissectum** (Spreng.).—*Botrychium dissectum* Spreng. Anleit. 3:172. 1804.

**Sceptridium japonicum** (Prantl).—*Botrychium daucifolium* β japonicum Prantl, Jahrb. Bot. Gartens Berlin 3:340. 1884. *Botrychium japonicum* (Prantl) Underw., Bull. Torr. Bot. Club 25:538. 1898.

**Sceptridium Jenmani** (Underw.).—*Botrychium Jenmani* Underw., Fern Bull. 8:59. 1900.

**Sceptridium matricariae** (Schrank).—*Osmunda matricariae* Schrank, Baier. Fl. 2:419. 1789. *Botrychium matricariae* (Schrank) Spreng., Syst. Veg. 4:23. 1827.

**Sceptridium obliquum** (Muhl.).—*Botrychium obliquum* Muhl., Willd. Sp. Pl. 5:62. 1810.

**Sceptridium obliquum elongatum** (Gilbert & Haberer).—*Botrychium obliquum elongatum* Gilbert & Haberer, Fern Bull. 11:89. 1903.

**Sceptridium obliquum Habereri** (Gilbert).—*Botrychium obliquum Habereri* Gilbert, Fern Bull. 11:88. 1903.

**Sceptridium obliquum intermedium** (Underw.).—*Botrychium obliquum intermedium* Underw., Our Native Ferns, ed. 6, 72. 1900.

**Sceptridium obliquum oneidense** (Gilbert).—*Botrychium ternatum oneidense* Gilbert, Fern Bull. 9:27. 1901.

**Sceptridium pusillum** (Underw.).—*Botrychium pusillum* Underw., Bull. Torr. Bot. Club 30:50. 1903.

**Sceptridium robustum** (Rupr.).—*Botrychium rutaefolium* var. *robustum* Rupr., Milde Nov. Act. Acad. Caes. Leop.-Carol. 26:763. 1858. *Botrychium robustum* (Rupr.) Underw., Bull. Torr. Bot. Club 30:51. 1903.

**Sceptridium Schaffneri** (Underw.).—*Botrychium Schaffneri* Underw., Bull. Torr. Bot. Club 30:51. 1903.

**Sceptridium silaifolium** (Presl).—*Botrychium silaifolium* Presl, Rel. Haenk. 1:76. 1825.

**Sceptridium subbifoliatum** (Brack.).—*Botrychium subbifoliatum* Brack., U. S. Expl. Exped. 16:317. 1854.

**Sceptridium tenuifolium** (Underw.).—*Botrychium tenuifolium* Underw., Bull. Torr. Bot. Club 30:52. 1903.

**Sceptridium ternatum** (Thunb.).—*Osmunda ternata* Thunb., Fl. Japon. 329. 1784. *Botrychium ternatum* (Thunb.) Sw., Schrader's Journ. Bot. 1800<sup>2</sup>:111. 1801.

**Sceptridium Underwoodianum** (Maxon).—*Botrychium Underwoodianum* Maxon, Bull. Torr. Bot. Club 32:220. 1905.

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